Data Collection and Information Presentation for Optimal Decision Making by Clinical Managers - The Autocontrol Project

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The Autocontrol methodology has been developed in order to support the optimisation of decision-making and the use of resources in the context of a clinical unit. The theoretical basis relates to quality assurance and information systems and is influenced by management and cognitive research in the health domain. The methodology uses population rather than individual decision making and because of its dynamic feedback design promises to have rapid and profound effect on practice. Most importantly the health care professional is the principle user of the Autocontrol system. In this methodology we distinguish three types of evidence necessary for practice change: practice based or internal evidence, best evidence derived from the literature or external evidence concerning the practice in question, and process based evidence on how to optimise the process of practice change. The software used by the system is of the executive decision support type which facilitates interrogation of large databases. The Autocontrol system is designed to interrogate the data of the patient medical record however the latter often lacks data on concomitant resource use and this must be supplemented. This paper reviews the Autocontrol methodology and gives examples from current studies.

INTRODUCTION

Given the increasing concern with health care costs, health services research is rapidly gaining momentum. Although there is a poor record of the application of quality assurance mechanisms applied to the process of health care this does not mean that physicians are not interested in making decisions that cut costs without changing quality. In a major survey of Quebec physicians, Chantal Roy found that over 95% were very interested in making cost-effective decisions [1]. As doctors are responsible for the majority of health care costs this is a very important observation, which we have confirmed in a survey of residents and consultants of the Sherbrooke teaching hospital centre. Dr Roy coined the term auto-control to give doctors the information necessary for cost-effective managerial decision making. We believe that this approach appropriately takes into account the expertise of the practitioner manager who is empowered by practice related information along with consideration of evidence of best practice.

Autocontrol can be characterised as the use of information by a clinician manager to make decisions for the optimisation of the quality and cost of a clinical process. It is applied at intervals determined by the clinical manager and feeds back the results of process related decisions as information for further decision making. A conceptual representation of the Autocontrol methodology is given in figure 1.

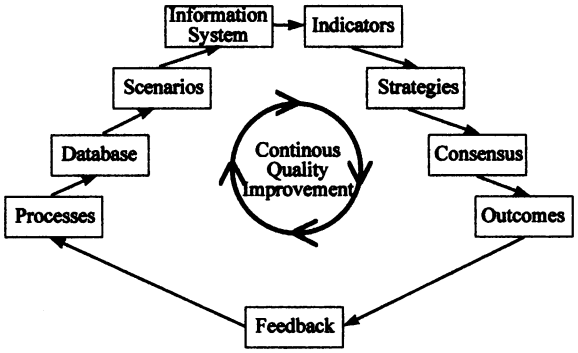

Figure 1 Autocontrol methodology

The question needs to made explicit how information needs to be collected and analysed so that the key elements of practice are being captured, analysed with subsequent strategies for improvement; how can the impact of such strategies be evaluated and maintained in continuing follow up? Is there a clear understanding as yet in medical practice how organisational and psycho-cultural factors influence individual decision making? Finally what is the role

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of different professionals? In an excellent recent review it was suggested that quality control audit should be at the level of a quality manager and that health care professionals rather have responsibility for decisions for individual patients [2]. On the contrary, we believe that the clinician manager has an important role in the optimisation of quality of care.

We are looking at each of these issues as together they make up the complexity of decision making in the clinical environment. Our aim is to take advantage of data that is now accessible as a result of the progressive realisation of the electronic patient record. The patterns of practice inherent in this database are analysed using an approach where the user can directly and dynamically interrogate the system. We describe our approach as dynamic feedback and this is we believe a key feature of our methodology. The user interrogates the system not randomly but with a strategy previously planned based on his judgement and experience; as he uses the system the results of a first interrogation may give information which leads him to select a new strategy which now seems more promising. This is in contrast to a more traditional situation where the user may get a set of standard reports and later may be predisposed to return to the system manager to have a new report produced.

The development of information systems in business and in industry that record the data of their diverse operations has lead to the possibility of exploiting these repositories of information for managerial decision making. This has lead to the development of generic software that can fetch the information that the manager wants from the existing databases available to him. The term executive decision system is applied to a set of tools conceived to assist an organisation to follow the state of its current activities, its progress towards the attainment of its goals and the relationship between its perception of reality and the key information available [3]. These systems have the following principle characteristics: they answer specific information needs tailored to the decision styles of the user; they use both internally and externally derived information; they use advanced graphical properties to represent information of different types; their interface should be very user-friendly and can use different interfaces (mouse, touch-screen, voice etc.,); they should give rapid access to pertinent information for decision making; they can furnish reports on variations highlighting tendencies and deviations relating to pre-established benchmarks. They use a so-called drill down approach for a more detailed analysis of a data set. For example, suppose the clinical manager of a medical unit considered the duration of stay as an important indicator of his unit's performance and that one day the system signalled to him an important deviation from the mean duration of stay, he could use the drill down technique to analyse the reasons - new complications, change of treatment protocol, etc.

METHODOLOGY

A request for data extraction is made from the hospital information system ARIANE (HDS, California) according to the data sets and the time period required. Since 1990 this system has recorded all biochemistry, hematology and microbiology diagnostic tests and all radiology requests made at the CUSE and this is now a paperless system. Further diagnostic services e.g. cardiology investigations, pathology investigations have since been progressively added. The patient discharge summary and CIM-9 coding for primary and secondary diagnoses, and surgical interventions is also available in the system dating back to 1990. This now gives a rich data repository for practice based research.

The data is transferred to an Access (Microsoft, California) relational database and this in turn is interrogated using the executive information system PowerPlay, (Cognos, California). The Transformer component of PowerPlay enables a multidimensional data construct; this is explored by the user with the Explorer component which can bring to the fore specific relations and express these graphically or in tabular form, e.g. how many patients with a given disease underwent routine investigation at admission or during follow-up after surgery ?

Scenarios believed to merit evaluation are chosen jointly with the clinician team responsible for a clinical unit. An example scenario is that chosen by the director of the Surgical Intensive Care Unit, namely the requesting of blood gases. We are evaluating the facility of the health care professional to use the system, as well as the utility of this information in leading to recommendations for changing how tests are used. Subsequently it is intended to investigate how the information is used to communicate the need for these changes including the impact of information obtained from published

best practice, to assess whether this information corresponds to any recorded practice norms, and also to evaluate the cost-savings potential of recommended changes.

RESULTS

An analysis has been made of 14 months of clinical data involving 666 patients who received a total of 2332 surgical interventions including 256 cardiac bypass patients. A total of 4893 blood gas estimations were requested.

practices and how they might be usefully examined with a view to saving costs without affecting quality. Figure 2 shows the variation for mean length of stay for each patient age group.

Figure 3 shows the variation in demand for blood gases during the night shift and it is noted that there is a peak in the morning at 5 am. This is probably an habitual testing that can be modified according to case severity and result in cost saving without disturbing quality of care.

For each figure the upper menu is offering the choice to the user as to whether he wants to know about

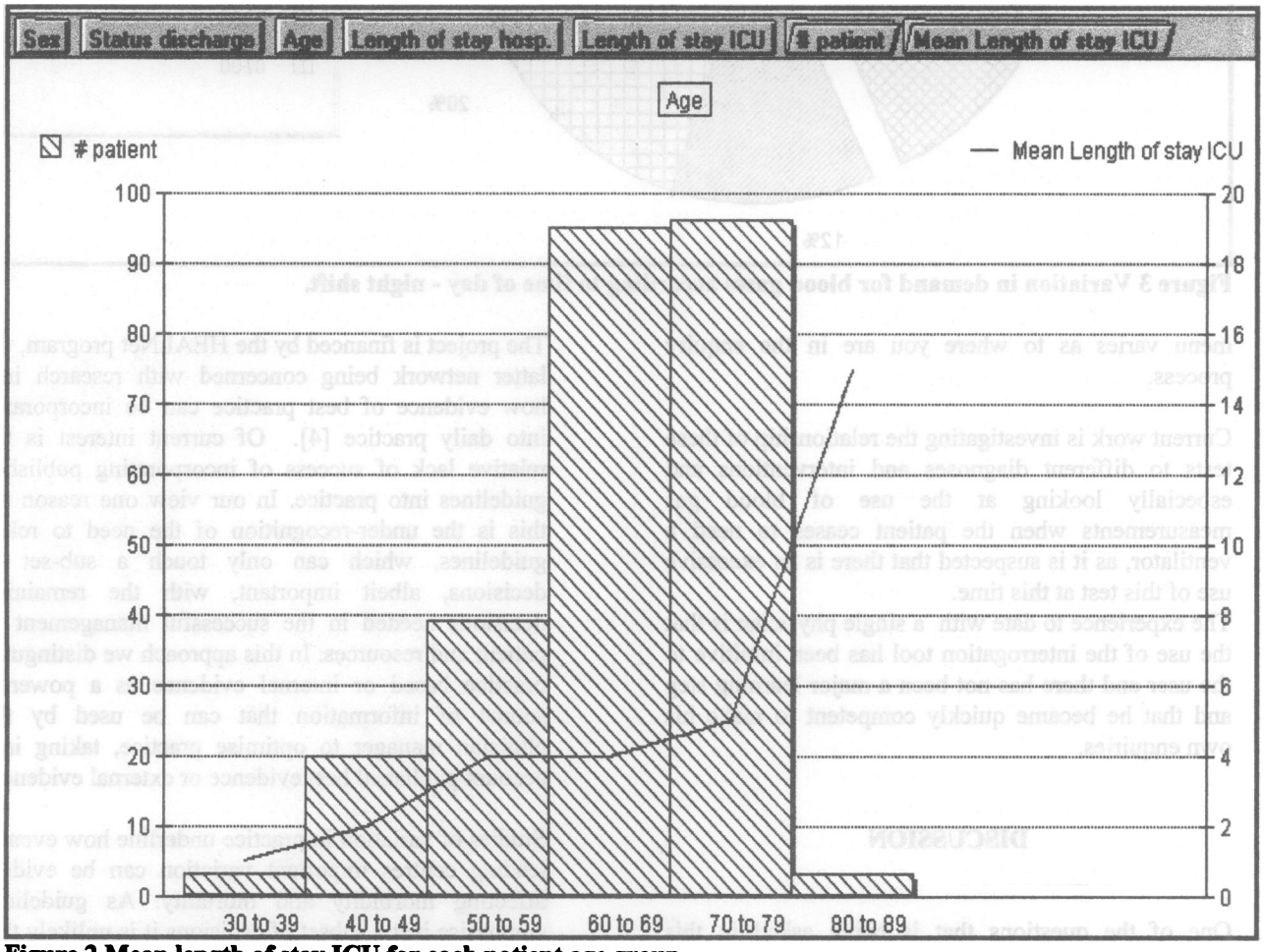

Figure 2 Mean length of stay ICU for each patient age group

Initial studies have concerned the distribution of testing across time which reveal particular patterns. The commentary of the physician is that this data will be useful to him to demonstrate the extent of routine

different relationships or in more detail. For example to know about test use according to weekday, or change from number of tests to cost of tests. The

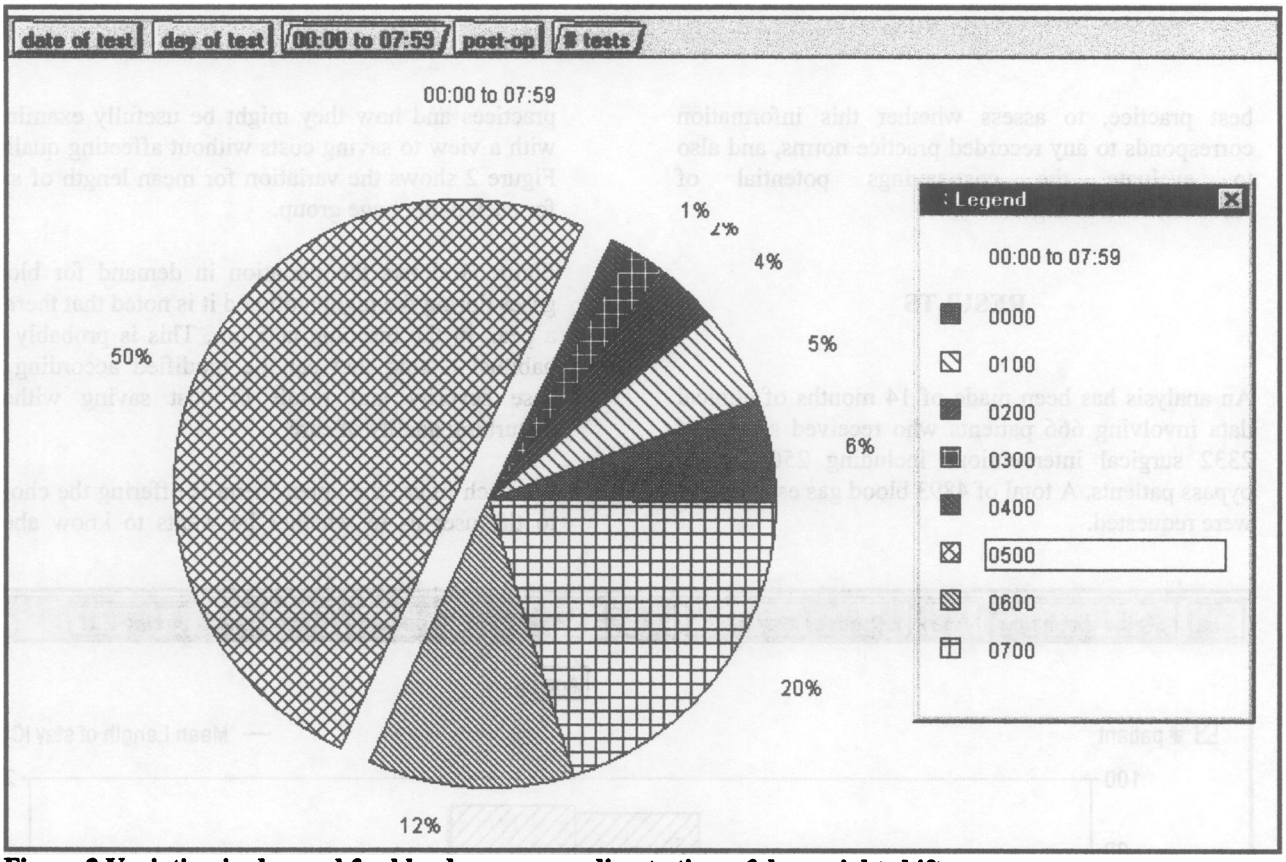

Figure 3 Variation in demand for blood gases according to time of day - night shift.

menu varies as to where you are in the enquiry process.

Current work is investigating the relationship of these tests to different diagnoses and interventions and especially looking at the use of blood gas measurements when the patient ceases to need a ventilator, as it is suspected that there is an excessive use of this test at this time.
The experience to date with a single physician is that the use of the interrogation tool has been intuitive to the user and there has not been a major learning step and that he became quickly competent to make his own enquiries.

DISCUSSION

One of the questions that is being asked in this research is whether the management of the information that reflects the process of functioning of a clinical unit can successfully augment the quality of a clinical unit; eventually it is intended to evaluate whether it can also be shared as information between comparable clinical units.

The project is financed by the HEALNet program, the latter network being concerned with research into how evidence of best practice can be incorporated into daily practice [4]. Of current interest is the relative lack of success of incorporating published guidelines into practice. In our view one reason for this is the under-recognition of the need to relate guidelines, which can only touch a sub-set of decisions, albeit important, with the remaining decisions needed in the successful management of patient and resources. In this approach we distinguish practice based or internal evidence as a powerful source of information that can be used by the clinician manager to optimise practice, taking into account published best evidence or external evidence.

Studies of variation in practice underline how even in leading centres important variation can be evident affecting morbidity and mortality. As guidelines emphasise just a subset of decisions it is unlikely that guidelines alone can be sufficient to improve practice. This has lead to the approach to integrate guidelines into practice so that the relevant guidelines can be appropriately available on-line when the need for decision can be made.

Our approach not only focuses on optimising practice it takes into account the efficiency of the optimisation process. A single set of guidelines take many months to produce and then apply. With Autocontrol, practice variation and different outcomes can be analysed and strategic decisions made to improve practice. A dynamic feedback has been introduced both with respect to the ability to interrogate and explore the database to detect important evidence for the need for practice change, but also in the way that change of practice can be monitored and analysed in an ongoing way.

The use of the information generated by the Autocontrol system to change practice will also be studied and evaluated. Indeed we are calling this process based evidence. That is to say that evidence that can be gained on how practice can be improved is in itself important information. It may give insight into better educational approaches. Resistance to change may reveal areas where change may not be appropriate without further study or require organisational change. We believe that an important step in effecting change is the use of information generated by the Autocontrol system, integrated with evidence of best practice to obtain consensus by colleagues working in the same clinical environment and thus developing a culture and a methodology for quality optimisation [5].

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References

1. Roy C. Thèse de doctorat, Université de Montpellier II, France, 1994.

2. Henry SB. Informatics: Essential Infrastructure for Quality Assessment and Improvement in Nursing. Journal of the American Medical Informatics Association, 2, 169 - 182, 1995.

3. Van den Hoven J. Executive support systems and decision making. J. Systems Management, 47, 48-55, 1996.

4. http://hiru.mcmaster.ca/nce

5. Blumenthal D, Epstein A. The role of physicians in the future of quality management. New England Journal of Medicine, 335, 1228-1331, 1996.